

### **REMARKS**

In view of the above amendments and following remarks, reconsideration of the objections and rejections contained in the Office Action of September 26, 2002 is respectfully requested.

The various formal matters raised by the Examiner on page 2 of the Office Action have been addressed by the above amendments to the specification.

The Examiner rejected claims 1-4 as being indefinite. However, these original claims have now been canceled and replaced with new claims 5-16. Each of these claims has been carefully drafted so as to fully comply with all of the requirements of 35 U.S.C. §112. In particular, claims 5-10 clearly represent apparatus claims, and claims 11-16 clearly represent method claims. However, it is noted that such claims closely correspond to each other such that restriction is not appropriate under the present circumstances.

The Examiner further rejected claims 1-4 as being anticipated or obvious over WO '541 or Mair, U.S. 3,903,708. However, it is respectfully submitted that neither of these references discloses or suggests the invention, especially as now set forth in claims 5-16.

The present invention provides a processing plant and a processing method for handling combustible fluids. In previous processing plants, particularly for the production of oil, a processing section includes integral safety systems in the form of pressure control valves, safety valves and blow down valves which conduct surplus or residual fluids to a collection line. Noting for example Fig. 1, the collection line 9 could emit these fluids to the atmosphere, or to a flare 10 for burning. In the case of connecting the line with the flare, combustion gas is usually added to ensure a minimum flame being maintained. With respect to emission into the atmosphere, an inert gas is usually added in order to prevent explosion. Needless to say, both of these methods involve environmental pollution, waste and increased cost.

Accordingly, the present invention provides a processing plant designed and arranged to recycle surplus and residual gases from the processing section. Noting Fig. 2, the present invention provides a processing section 1 that is operable to process combustible fluids. A gas valve is connected with the processing section, which could be a blow down valve, a pressure control valve or a pressure safety valve (6, 7 and 8), which are designed to allow fluid to escape

to a collection line 9. Thus the valves are operable to relieve the gas pressure from the processing section by conducting the surplus or residual gas therefrom. The collection line, connected with the gas valve, receives the gas from the processing section through the gas valve. At least one low-pressure store 2 is connected with the collection line so that the gas from the processing section is conducted to the at least one low pressure store. At least one second line, 3 or 11, is connected to the low-pressure store 2 and operable to conduct fluid therefrom. As can be seen from Fig. 2, this could be a line 11 which is connected to a gas area of the low-pressure store 2. Condensed gas and liquid from the fluid can be returned to the processing section 1 through a raw product line 3, especially in a case where the low-pressure store is a raw product store.

Independent claims 5 and 11 reflect the present invention by reciting the processing plant or processing method. The processing section is operable to process combustible fluids, and a gas valve is connected with the processing section and operable to relieve gas pressure from the processing section by conducting surplus or residual gas from the processing section. A collection line is connected with the gas valve, the valve conducting the gas from the processing section to the collection line. The collection line is connected to at least one low-pressure store so that the gas from the processing section is conducted to the at least one low-pressure store. At least one second line is connected to the at least one low-pressure store and operable to conduct fluid from the low-pressure store.

The above invention is neither disclosed nor suggested by the references cited by the Examiner.

The Examiner states that surplus or residual gases are conducted by a collection line 9 to one or more low-pressure stores in WO '541 and Mair. However, it seems clear from WO '541 that the branch conduit 72 leads to a torch 74, as in the prior art. More particularly, conduit 40 eventually leads to a conduit 68 between a separator 22 and a compressor 26 at a connection point 66. As described on page 7, in emergency situations, such as a sudden increase in the gas pressure, the safety arrangement opens to lead to the branch conduit 72 to the torch 74. The other connection of conduit 40 is not to a low-pressure store, it is noted. Rather, it returns to the processing section, as can be seen from Fig. 1.

Accordingly, WO '541 does not meet the limitation of the collection line, being connected with the gas valve which is operable to relieve gas pressure from the processing section, being connected to at least one low-pressure store. Similarly, it does not meet the method step of conducting the gas from the processing section to the at least one low-pressure store with the collection line as recited in claim 11.

Mair similarly discloses, in column 1, noting lines 43-46, a vent means connected to a vapor outlet of the last stage condensing means for discharging to atmosphere the uncondensed vapor stream therefrom. Thus Mair also does not recognize the benefit of the present invention, and vents gases to the atmosphere.

It should be further noted that in Mair a typical application of the invention of Mair is the recovery of vapors produced during the loading of gasoline and the like into a tank truck at a loading terminal. As such, it is respectfully submitted to be clear that Mair does not disclose a processing section in accordance with the present invention, that is operable to process combustible fluids, and in particular does not disclose or suggest a processing section operable to separate gaseous hydrocarbons from oil. Nor does Mair disclose or suggest at least one low-pressure store, particularly one which stores crude oil upstream of the processing section.

Should the Examiner maintain either of the rejections based upon the above references, the Examiner is respectfully requested to particularly point out how the references meet the limitations of each of the claims rejected thereby. This is because it is respectfully submitted and believed that these references do not in fact properly disclose or suggest the combination of a processing section that is operable to process combustible fluids with a gas valve operable to relieve gas pressure from the processing section, connected with a collection line which is operable to conduct the gas from the processing section to at least one low-pressure store, along with at least one second line that is connected to the at least one low-pressure store, as recited in claim 5, and in method form in claim 11.

In view of the above, it is respectfully submitted that the present invention clearly patentably distinguishes over each of the references cited by the Examiner. Indication of such is respectfully requested.

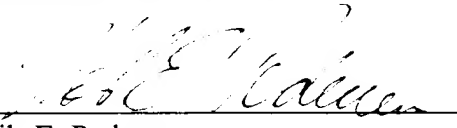
In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Attached hereto is a marked-up version of the changes made to the specification by the current Amendment. The attached page is captioned "**Version with Markings to Show Changes Made**".

Respectfully submitted,

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## PROCESS PLANT

### Background of the Invention

**[0001]** The present invention relates to a process plant for handling combustible fluids, for example an oil production plant in which gaseous hydrocarbons are separated from oil and in which surplus gases or residual gases from uncontrolled build-ups of gas pressure in the process escape through process or safety valves in the process plant and are conducted to a collection line.

**[0002]** It should be stressed that the expression process plant means not only plants for oil production in which hydrocarbon gases are separated from oil, but also refining plants and all types of equipment or plants in which combustible fluids are formed which must be handled optimally in terms of safety, finance and the environment.

**[0003]** In a process plant, for example a plant for the production of oil, there will normally be a large number of separators, compressors and/or other process equipment which are connected, in the process pipe line system, with valves, pressure regulators, temperature regulators and other components which, in given situations, may fail and lead to leaks, the uncontrolled build-up of pressure, etc. The plant therefore has integral safety systems in the form of pressure control valves, safety valves and blow down valves which are connected to and will conduct surplus or residual fluids to a collection line for further transport to a flare for burning or emission into the atmosphere. In connection with flare burning, a combustion gas is usually added to the collection line continuously to ensure that a minimum flame is maintained in the flare. In connection with emission into the atmosphere without burning, an inert gas is usually added to prevent explosion.

**[0004]** British patent application no. 2.066.936 describes a refining plant for oil in which surplus gases in the form of hydrocarbons are recovered. The surplus gases are diverted from a flare line system and condensed in one or more stages by compression and cooling. The condensate is returned to the process. The residual gas, however, is conducted to a flare tower and burned.

**[0005]** East German patent specification no. 266.006 mentions a plant for combining combustible gases from several sources with different compositions in two main streams. The gases are combined using a computer which regulates the mixture on the basis of measurements of the calorific value of the gases. The gases are burned in a flare tower.

[0006] Moreover, Norwegian patent no. 177161 describes a solution for recovering surplus gas from an oil/gas treatment plant in which the surplus gas is collected in a collection line and recovered, while gas which escapes in an emergency situation, in connection with an abnormal increase in pressure (blow out), is conducted to a branch line for burning in a flare tower.

[0007] For all of the above known solutions, flares are used to burn all or part of the surplus gases or residual gases from the process plant. However, the use of a flare entails several disadvantages:

- The construction of the flare (flare tower) in itself is very expensive and will account for a not inconsiderable part of the overall costs of a process plant.
- Burning or emitting the surplus gases represents an environmental problem as CO<sub>2</sub> and hydrocarbon gases will, among other things, contribute to the greenhouse effect.
- The surplus gases or fluids are valuable in themselves and represent a direct financial loss when burned or emitted into the environment.

#### Summary of the Invention

[0008] The present invention involves ~~describes~~ a device in connection with a process plant in which the stated disadvantages have been eliminated, i.e. in which the flare has been removed and all surplus gases and residual gases are dealt with and recycled.

[0009] The present invention is characterized ~~characterised~~ in that the surplus or residual gases are conducted via a collection line to one or more low-pressure stores and that a connection line or return line is arranged from the store's gas area to the process or another treatment unit for the processing of the gas.

~~Claims 2-3 define advantageous features of the invention.~~

#### Brief Description of the Drawings

[0010] The present invention will be described in the following in further detail by means of examples and with reference to the attached drawings, where

[0011] Fig. 1 shows a simplified process diagram for a traditional process plant with a flare tower, and

[0012] Fig. 2 shows a simplified process diagram for a process plant in accordance with the present invention without a flare tower.

#### Detailed Description of the Preferred Embodiment

[0013] Fig. 1 shows, as stated, a simplified process diagram of a traditional process plant, for example an oil production plant, in which a flare tower is used to burn the surplus gases. The raw product or crude oil is added to a the process 1 from one or more low-pressure crude oil stores 2 via a line 3. The process itself may comprise several process stages with compressors and condensers (not shown) and is designed to separate gaseous hydrocarbons from the oil and transfer them as processed products, for example via lines 4; and 5, to an appropriate product store 13.

[0014] A process plant like this will, as stated in the introduction, contain equipment and components, for example valves, pressure regulators and temperature regulators, which may fail and lead to leaks and build-ups of pressure. The plant will, therefore, be fitted with blow down valves (BDV), pressure control valves (PV) and pressure safety valves (PSV) 6, 7; and 8, which are designed to allow fluid (gas) to escape in connection with a shutdown and when unforeseen leaks or build-ups of pressure occur. These fluids are collected in a collection line 9 and conducted to a flare tower 10 for burning or emission into the atmosphere. In the latter case, inert gas is also added from an inert gas source (not shown) via line 14.

[0015] Fig. 2 shows a simplified process diagram of the solution in accordance with the present invention. The process is the same as in the example shown in Fig. 1 and described above, but the flare tower has been eliminated by having the fluid which is collected in the collection line 9 being returned to the low-pressure crude oil store 2 upstream of the process plant.

[0016] Surplus gases which are collected in the store 2 can expediently be returned to the process as gas for reuse via line 11. If the conditions are present, some of the gas will condense in the low-pressure store 2. This condensed gas and any liquid from the fluid can expediently be returned to the process via the raw product line 3. In order to create lower pressure and thus increased capacity in the store 2, a fan or compressor 12 can also be arranged in connection with the

return line 11. It should be noted that the present invention will require a relatively large store volume to be able to work within fixed safety margins. Such a volume will usually exist at all major crude oil plants.

[0017] However, it should also be noted that the present invention as it is described in the claims is not restricted to a solution in which the surplus gases or fluids have to be conducted to the low-pressure product store. It is possible to establish a separate store volume, for example a separate tank to which the surplus gases are conducted. Moreover, the collected gas or fluid (liquid) does not have to be returned to the process but can be conducted to another separate treatment unit (not shown). Moreover, a control valve 15 should be arranged in connection with the collection line 9 in order to isolate the low-pressure store 2 from the process when the plant is not in operation. Moreover, surplus pressure protection 16 ~~17~~ should be arranged in parallel with the control valve 15 in case the latter fails to open. A manual stop valve (diverter valve) 17 should be used to allow maintenance of the control valve 15 and the surplus pressure protection ~~17~~ 16.

[0018] The present invention provides ~~describes~~ a solution in connection with a process plant which has a number of advantages compared with the known solutions:

- The use of a flare tower with associated equipment is completely eliminated and the investment costs in connection with the construction of the process plant and the maintenance costs are therefore considerably less.
- By eliminating the use of a flare, emissions of environmentally hazardous hydrocarbon gases, CO<sub>2</sub> and NO<sub>x</sub> gases are avoided. At the same time, major savings are achieved as there will be no need to add gas to the pilot flare and as the surplus gases are returned to the process and "reused".
- As the construction of a flare tower is not necessary, the visually unattractive structure of the flare tower is also avoided. Moreover, the unattractive flare, the high noise level and the smoke which are associated with the use of a flare are also avoided.
- Moreover, the present invention offers an improvement in safety, among other things because the use of an open flame is eliminated and the relief of surplus pressure built up will be shorter.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

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Process plant

Background of the Invention

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It should be stressed that the expression process plant means not only plants for oil production in which hydrocarbon gases are separated from oil, but also refining plants and all types of equipment or plant<sup>s</sup> in which combustible fluids are formed which must be handled optimally in terms of safety, finance and the environment.

In a process plant, for example a plant for the production of oil, there will normally be a large number of separators, compressors and/or other process equipment which are connected, in the process pipe line system, with valves, pressure regulators, temperature regulators and other components which, in given situations, may fail and lead to leaks, <sup>the</sup> uncontrolled build-up of pressure, etc. The plant therefore has integral safety systems in the form of pressure control valves, safety valves and blow down valves which are connected to and will conduct surplus or residual fluids to a collection line for further transport to a flare for burning or emission into the atmosphere. In connection with flare burning, a combustion gas is usually added to the collection line continuously to ensure that a minimum flame is maintained in the flare. In connection with emission into the atmosphere without burning, an inert gas is usually added to prevent explosion.

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For all of the above known solutions, flares are used to burn all or part of the surplus gases or residual gases from the process plant. However, the use of a flare entails several disadvantages:

- The construction of the flare (flare tower) in itself is very expensive and will account for a not inconsiderable part of the overall costs of a process plant.
- Burning or emitting the surplus gases represents an environmental problem as CO<sub>2</sub> and hydrocarbon gases will, among other things, contribute to the greenhouse effect.
- The surplus gases or fluids are valuable in themselves and represent a direct financial loss when burned or emitted into the environment.

*Summary of the Invention*  
 The present invention describes a device in connection with a process plant in which the stated disadvantages have been eliminated, i.e. in which the flare has been removed and all surplus gases and residual gases are dealt with and recycled.

The present invention is characterized<sup>z</sup> in that the surplus or residual gases are conducted via a collection line to one or more low-pressure stores and that a connection line or return line is arranged from the store's gas area to the process or another treatment unit for the processing of the gas.

~~Claims 2-3 define advantageous features of the invention.~~

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A process plant like this will, as stated in the introduction, contain equipment and components, for example valves, pressure regulators and temperature regulators, which may fail and lead to leaks and build-ups of pressure. The plant will, therefore, be fitted with blow down valves (BDV), pressure control valves (PV) and pressure safety valves (PSV) 6, 7 <sup>and</sup> 8, which are designed to allow fluid (gas) to escape in

connection with a shutdown and when unforeseen leaks or build-ups of pressure occur. These fluids are collected in a collection line 9 and conducted to a flare tower 10 for burning or emission into the atmosphere. In the latter case, inert gas is also added from an inert gas source (not shown) via line 14.

Fig. 2 shows a simplified process diagram of the solution in accordance with the present invention. The process is the same as in the example shown in Fig. 1 and described above, but the flare tower has been eliminated by <sup>burning</sup> the fluid which is collected in the collection line 9 ~~being~~ returned to the low-pressure crude oil store 2 upstream of the process plant.

Surplus gases which are collected in the store 2 can expediently be returned to the process as gas for reuse via line 11. If the conditions are present, some of the gas will condense in the low-pressure store 2. This condensed gas and any liquid from the fluid can expediently be returned to the process via the raw product line 3. In order to create lower pressure and thus increased capacity in the store 2, a fan or compressor 12 can also be arranged in connection with the return line 11. It should be noted that the present invention will require a relatively large store volume to be able to work within fixed safety margins. Such a volume will usually exist at all major crude oil plants.

However, it should also be noted that the present invention as it is described in the claims is not restricted to a solution in which the surplus gases or fluids have to be conducted to the low-pressure product store. It is possible to establish a separate store volume, for example a separate tank to which the surplus gases are conducted. Moreover, the collected gas or fluid (liquid) does not have to be returned to the process but can be conducted to another separate treatment unit (not shown). Moreover, a control valve 15 should be arranged in connection with the collection line 9 in order to isolate the low-pressure store 2 from the process when the plant is not in operation. Moreover, surplus pressure protection <sup>6</sup>17 should be arranged in parallel with the control valve 15 in case the latter fails to open. A manual stop valve (diverter

valve) 17 should be used to allow maintenance of the control valve 15 and the surplus pressure protection <sup>6</sup>17.

The present invention <sup>provide</sup> describes a solution in connection with a process plant which has a number of advantages compared with the known solutions:

- The use of a flare tower with associated equipment is completely eliminated and the investment costs in connection with the construction of the process plant and the maintenance costs are therefore considerably less.
- By eliminating the use of a flare, emissions of environmentally hazardous hydrocarbon gases, CO<sub>2</sub> and NO<sub>x</sub> gases are avoided. At the same time, major savings are achieved as there will be no need to add gas to the pilot flare and as the surplus gases are returned to the process and "reused".
- As the construction of a flare tower is not necessary, the visually unattractive structure of the flare tower is also avoided. Moreover, the unattractive flare, the high noise level and the smoke which are associated with the use of a flare are also avoided.
- Moreover, the present invention offers an improvement in safety, among other things because the use of an open flame is eliminated and the relief of surplus pressure built up will be shorter<sup>7</sup>.